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Cheers!

We drink to the health and prosperity of the veterinary profession in the coming year.

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The President's New Year Message

IN this, the first issue for 1960 of our official journal, it is my privilege, on behalf of Mrs. Hignett and the Officers of the British Veterinary Association, to extend to all members, and to all other readers, our most cordial good wishes for a happy New Year.

Ours is a profession small in numbers, but since our interests are international this journal is read throughout the world; in addition to my British colleagues, therefore, I greet in the Association's name all veterinary surgeons of all nationalities who may read these words. In particular, my thoughts go out to those working in undeveloped countries where their skilled services are helping to provide a higher standard of living; may their labours be more than ever rewarded and rewarding in the year before us.

At home, the New Year will usher in, for the B.V.A., two noteworthy advances. I refer to the appointment of a professional secretary in the person of Mr. John Anderson, M.R.C.V.S., and to the launching of our new journal, *Research in Veterinary Science*, the first number of which will appear this month. Mr. Anderson has formidable tasks before him, but my fellow Officers and I are confident that, with his own abilities fortified by the goodwill of his colleagues in the profession, he will overcome every difficulty and set a very high standard for those who follow him in this important office.

A message of goodwill and greeting, such as this, cannot dwell in detail upon the affairs of our Association, but the year that is just past has been notable, among many other things, for endeavours to collect and collate clinical information on the diseases of exotic pets and caged birds which are being kept in this country in ever increasing numbers. A handbook in active preparation will, we hope, be of value to those faced with these problems which are to a large extent outside the normal curriculum.

Comparative medicine, finding its practical application in public health, has also claimed the time of a number of veterinary surgeons and perhaps the most striking example of the association between veterinary and medical studies occurred at last year's Annual Congress, when a medical research worker of world reputation opened the discussion on a paper devoted to comparative studies of human and animal cancer.

Having referred to Congress, perhaps I should mention that, as a result of the long printing dispute in the summer of 1959, the Congress Proceedings have been delayed in publication. They will appear, however, as a special edition of THE VETERINARY RECORD, the pages being numbered to bind in with the 1959 issues.

It has been a source of pleasure to the Officers and the Council that our relationships with the Royal College of Veterinary Surgeons, the National Farmers' Union, Government Departments, and many other learned and official bodies have remained most cordial, a state of affairs I have every hope will continue during the coming year. We aim to play our full part both in the field of science, fundamental and applied, and in the general life of the community; and these harmonious exchanges with those whose interests abut upon our own greatly facilitate our endeavours.

The New Year is a time both for looking back and for looking forward, acknowledging our shortcomings even as we draw encouragement and inspiration from such achievement as has fallen to our lot, being ever conscious that "a man's reach must be further than his grasp, or what is Heaven for?"

S. L. Hignett,
President

Some Aspects of the Nutrition of the Dog and Cat*

A. N. Worden : Patricia P. Scott : R. G. Booth

I.—The Dog

BY

A. N. WORDEN

Nutritional Research Unit, Huntingdon

IT is now over 15 years since the valuable review of the nutritional requirements of dogs by Michaud & Elvehjem (1944) was published, 10 years since the appearance of the second edition of McCay's (1949) text-book, and 5 years since the National Research Council's (1954) report on the nutrient requirements for this species was produced. A great deal has happened even since the last of these, and it would be impracticable in the time available to try to bring relevant knowledge up to date. Partial coverage of the field has been made by Bourne (1956) and by Schwick (1959), and it is proposed that this evening a few selected topics only should be dealt with.

Of general interest has been a study of drying conditions on the nutritive value of a processed stock diet designed primarily for dogs (Harms & Scott, 1956). A diet containing fish, whalemeat, meat-and-liver meal and biscuit waste, with propyl gallate as antioxidant, supported good growth in weanling rats after it had been dried in air temperatures below 140° C. The same diet, after drying at 140° or 150° C., produced fluctuating gains, and after drying at 160° C. led to anorexia, stunted growth, poor coats and reproductive failure. These symptoms were thought to resemble those shown by rats fed diets deficient in protein or in amino-acids such as tryptophan. There was some reduction in thiamine and vitamin A in the diet dried at 160°, as judged by chemical analyses, and possibly of other vitamins also, although the symptoms did not resemble those of any specific vitamin deficiency. The authors believed that the poor results, at least in the diet dried at 140°, were due principally to failure to digest the protein that had become "damaged" at this relatively low temperature by the formation of *N*-glycosides in the presence of reducing sugars.

Damage to, or inactivation of, amino-acids through processing is, of course, a widely recognised phenomenon, and in the case of many proteins it is the available lysine that becomes reduced through coupling of the ϵNH_2 group to form an amino-sugar. Special methods are now available for the chemical determination of available as opposed to total lysine. The last figure may be misleading and give a faulty index of the nutritional value of the protein. Even microbiological assays, with their attendant extraction procedures, give total as opposed to available lysine. For proteins intended for feeding to growing animals, including puppies, a satisfactory supply of available lysine is essential.

The beginning of the present decade saw what would appear to have been final clarification of the canine hysteria problem as related to the use of biscuits, bread or other farinaceous materials prepared from agenised flour. In experiments reported subsequently to those referred to at the forum meeting of this Society in 1950, methionine sulphoxamine was found to provoke typical symptoms in puppies. The prior administration of methionine itself was found to be protective, but once the signs were established methionine was without effect (Gershoff & Elvehjem, 1951).

The Feeding of Puppies

Puppies that have been used to feeding together will take more food in the presence of their fellows than when fed separately. Puppies that have been fed separately, even though reared together otherwise, do not for some time consume more food when fed together. In the studies reported by James & Gilbert (1955), the effect did not become significant until after some 14 days of alternate separate and group feeding.

In Swedish experiments on the artificial rearing of puppies it was found that excellent results were obtained with a mixture comprising: whole milk, 800 ml.; cream (12 per cent. fat), 200 ml.; one egg yolk; bonemeal, 6 g.; and citric acid, 4 g.; together with 2,000 I.U. vitamin A and 500 I.U. vitamin D. The puppies were caged individually, kept warm with lamps, and fed 6 times daily. The daily allowances of the mixture, as percentages of bodyweight, were 15 to 20 at 3 days of age; 22 to 25 at 7 days; 30 to 32 at 14 days of age; and 35 to 40 at 21 days (Björck, Olsson & Dyrendahl, 1957).

Puppies fed casein as the sole dietary protein have been found to retain somewhat less nitrogen than those fed whole egg protein, but more than twice as much as those fed wheat gluten. Nevertheless, animals on all 3 sources of protein gained in bodyweight at about the same rate, the increase per g. nitrogen intake being 9.0 g. for whole egg, 9.8 g. for casein and 8.8 g. for wheat gluten. There were, however, notable differences in behaviour, appearance and body composition. The animals fed wheat gluten were low in body protein but high in fat stores compared with those fed on egg or casein. Puppies fed egg protein were lean and active while those fed wheat gluten were obese and more lethargic. As Allison & Wannemacher (1957), who deal also with the repletion of depleted protein reserves in adult dogs, state: "these and other observations on growth or repletion of tissues emphasise the importance of establishing an optimal relationship between caloric and protein intake to keep a proper balance between fat stores and lean body mass."

Total Food Requirement

Recent studies on the total food requirement of dogs serve to confirm earlier findings and to indicate also the wide individual variations in voluntary con-

* Presented to the Central Veterinary Society on October 1st, 1959.

sumption. In a series of observations involving Alsatians, Salukis and Basset hounds, it was found that voluntary food intake ranged from 1 lb. per 20 lb. to 1 lb. per 50 lb. bodyweight daily, and was independent of breed. After 20 weeks on a diet supplying 1 lb. per 36 lb. bodyweight daily, all animals were in good condition and had received adequate food for maintenance purposes. The digestive efficiency at this level was about 80 per cent. Dogs having the largest appetites were the most active, but age and activity appeared to have little correlation as did weight and food intake within the range observed (James & McCay, 1950).

The effect of age was further studied in Beagle bitches ranging from 3 months to 12 years old. It again appeared that older animals could digest the dry matter of their ration as efficiently as younger ones. Young puppies, however, digested the protein of a low-protein ration, and the fat of a high-fat ration, less efficiently than adults (Lloyd & McCay, 1955).

Calorie : Protein Ratio

There seems little doubt, from the studies just referred to and from many other findings, that a correct calorie : protein ratio is of importance to adult dogs as well as to puppies. Nitrogen is wasted, as in other species, through restriction of caloric intake or through relative excess of dietary protein. Rosenthal & Allison (1951) studied the effect of restricted calories in experiments with adult Fox Terriers receiving a constant casein nitrogen intake of 3.82 g. per day per square metre of calculated body surface. Calories were varied by altering the intake of carbohydrate. In confirmation of earlier studies, 2 responses were recognised and, to quote from their summary: "the first response, obtained with even a slight reduction in dietary calories, was an increase in the excretion of urinary nitrogen without any change in the nitrogen balance index of the dietary protein, a response which reflected an increase in the catabolism of proteins. Continued feeding of a markedly restricted intake depleted the protein stores of the body. The second response followed the first in the presence of a severe caloric restriction and was dangerous to the animal. Some animals resisted the second response much more than others, a resistance which was correlated, at least in part, with the magnitude of the protein stores of the body. It is emphasised that responses to a restriction in calories vary with the physiological state of the animal and with the composition of the diet fed."

In our own studies on diets for sledge dogs, preparatory to the Trans-Antarctic Expedition of 1957-8 (Taylor, Worden & Waterhouse, 1959), we found evidence of faulty utilisation of beef pemmican, a dried and concentrated food made mainly from beef and consisting of about two-thirds protein and one-third fat. The analysis of the faeces from Huskies in the Antarctic indicated that about one-third of the protein and about 6 per cent. of the fat were excreted in the faeces. Studies in metabolism cages showed that during pemmican feeding there were abnormal urinary changes, retention of water, indicanuria, and excretion of fluorescent substances. There was reduction also in the output of thiamine and of riboflavin. The animals themselves sometimes lost weight and tended to develop loose stools. Substantial improvements, in the laboratory and in the field, were obtained when the calorie : protein ratio was adjusted.

Lipids

Fat is usually present in formulated dog foods. Typical formulations conforming to the standard for canned dog foods, agreed some years ago by the Institute of American Meat Packers, would contain about 8 per cent. fat on an original basis and have a calorific value of between 600 and 700 calories per lb. By contrast, comparable cat foods would have a fat percentage of only about 4, and a calorific value of between 500 and 600 calories per lb.

The utilisation of the calories of fat was found to be quite satisfactory in experiments with growing Cocker Spaniel puppies: there appeared to be equal utilisation from 4, 6 or 8 per cent. added stabilised fat and from isocaloric additions of sucrose to a basal ration comprising flaked maize, flaked wheat, soya bean, meat-and-bone scrap, fish meal, wheat germ, skim milk and vitamin supplements. The addition of 6 per cent. fat to a commercial dry dog meal was similarly beneficial (Seidler & Schweigert, 1952). In further experiments (Siedler & Schweigert, 1954), the addition of 4 or 8 per cent. fat, or of 18 per cent. sucrose, was found to increase the efficiency of a basal ration for maintenance of females prior to breeding, and at the 4 per cent. level there was some improvement in reproductive performance. The addition of 8 per cent. fat to the basal ration, however, appeared to lower the reproductive capacity of puppies in that, although more were born, the birth weight and the viability at 24 hours were lower.

Much higher levels of fat have been used for growth purposes. As would be predictable from earlier fundamental studies on the dog, and from the use of high-energy rations for broilers and other productive animals, at a dietary fat content as high as 30 per cent., the growth of weanling puppies has been found to improve with dietary protein level from 20 up to 29 per cent., although at 33.3 per cent. protein efficiency is no better (Ontko, Wuthier & Phillips, 1957). In these experiments larger puppies were more sensitive to faulty protein : calorie relationships than smaller ones. This again would have been predictable on general grounds. An extremely high level of fat, *i.e.* 40 per cent. of the diet, has been reported to cause a greater loss of calcium in adult dogs than a level of 5 per cent. (Liu & McCay, 1953).

A possible harmful effect of a high fat intake in very young puppies has been reported by McLintock & Wilkinson (1954). Severe ataxia, nodding movements of the head, muscular tremors, diminished pedal reflexes, bloated abdomen and breath smelling of acetone was found in all 6 members of a litter of 4-week-old Samoyeds.

Work during the past 2 decades on fat as a dietary essential for the dog was discussed at the symposium on non-parasitic skin diseases in dogs and cats held by this Society in 1957 (Worden, 1958), and some aspects on a previous occasion, the "forum" relating to the nutrition of the dog held in 1950 (*Vet. Rec.*, 1952, **64**, 232). Reference was made at the symposium

to the extensive studies on experimental fat deficiency in the dog by Hansen and his colleagues (Hansen & Wiese, 1943, 1951; Wiese & Hansen, 1951 a, b; Hansen, Holmes & Wiese, 1951) and to the circumstantial evidence that fat-deficiency occurred in dogs during the second world war (Joshua, Iszard & Worden, 1945).

Parenteral feeding studies have indicated that dogs remained healthy and without loss of bodyweight if a significant proportion—in this instance 34 per cent. —of the total calorific intake (of 80 calories per kg. bodyweight daily) was derived from fat, but not when this fat was replaced isocalorically by glucose. Isocaloric replacement with glucose together with the methyl esters of linoleic, linolenic and arachidonic acids was, however, reported as satisfactory (Meng, Youmans, Cain & Grimes, 1953).

There has not, however, been general agreement on the role of these so-called essential fatty acids (E.F.A.) in species other than the rat, and in man it remains a vexed question whether these E.F.A. are responsible for the effects on blood cholesterol levels of certain unsaturated fats, or whether the activity is due to some other properties of the unsaturated fraction. Current evidence favours the latter, but the dog must be studied in its own right.

The effect of diet upon blood cholesterol and upon atherosclerosis has been studied by a number of workers (including Bevans, Davidson & Abell, 1951; Shull, Mann, Andrus & Stare, 1954; Barr, Russ, Eder, Kendall & Abell, 1955; and Marmorston, Rosenfeld & Mehl, 1959). Shull *et al.* found a very varying blood cholesterol response to a high dietary cholesterol, but that even with prolonged elevation of blood cholesterol and lipoproteins there was no arteriosclerosis. The other workers have fairly consistently reproduced atherosclerosis from a combination of cholesterol and thiouracil, or by total thyroidectomy followed by a high cholesterol diet. Marmorston *et al.* have described a marked degree of involvement not only of the coronary vessels, but also of the cerebral arteries and of most of the smaller vessels of the body.

Calcium

The recent important studies by Scott and her colleagues on cats will presumably be discussed later. An osteoporosis, associated with flesh-eating habits, occurs in other carnivora and Scott (1959) has expressed considerable doubt on the contention that *osteogenesis imperfecta*, of the kind described in a 10-week-old Collie bitch by Holmes & Price (1957), is of genetic origin. It would seem much more likely that nutritional factors, of the kind operative in cats, are responsible.

There is certainly need to check the calcium (Ca) intake, and the calcium : phosphorus (Ca : P) ratio in dog diets. This was made clear in the studies of Morgan and her colleagues over 25 years ago (Morgan & Garrison, 1933; Morgan, Garrison & Hills, 1933; Morgan, 1933). These workers showed that high calcium (230 to 740 mg. per kg. bodyweight daily) combined with low phosphorus (90 to 140 mg. per kg. daily) diets, in which the Ca : P ratio was from 1.6 up to 8.2 : 1, were rachitogenic in the absence of vitamin D, whereas a low calcium and high phosphorus ration gave rise to a characteristic osteoporosis. In one experiment this condition, described as *osteitis fibrosa*, arose from the feeding of a diet supplying only 100 mg. Ca per kg. but 1.02 g. P per kg. bodyweight daily, a Ca:P ratio of 0.1:1. The young dogs recovered when given adequate calcium lactate. In their experiments in which the Ca : P ratio was nearer to unity (over Ca intakes of 360 to 800 mg. Ca and 420 to 570 mg. P per kg. bodyweight daily, giving Ca : P ratios of from 0.7 to 1.4 : 1), calcium and phosphorus retention was nearly the same whether or not vitamin D was added.

Later studies, in so far as they have taken these basal findings into account in the experimental design, are supportive. On low Ca intakes (4 to 8 mg. per kg. bodyweight daily) dogs of from 6 to 25 weeks of age all show negative Ca balances, there being no age at which losses are at a minimum. In older animals, of from 6 to 15 years, there is difficulty in maintaining Ca equilibrium unless at least 86 mg. Ca per kg. is supplied daily (Liu & McCay, 1953). In studies on fresh bone it was shown that, on the same basal diet, Ca retention in growing dogs fell from 56 per cent. at 80 days of age to 26 per cent. at 200 days and to 20 per cent. at 330 days. In the same animals retention of P was similarly 56 per cent. at 80 days, fell to 30 per cent. at 120 days, but had risen to 45 per cent. at 330 days (Udall & McCay, 1953).

Recently Gershoff, Legg & Hegsted (1958) have studied the adaptation to different calcium intake in dogs. During the period of rapid growth, 90 per cent. of Ca in a diet containing 0.114 per cent. Ca, 46 per cent. of that in a diet containing 0.634 per cent. Ca, and 27 per cent. of that in a diet containing 1.234 per cent. Ca, were retained. As the dogs grew older, those accustomed to a low Ca intake appeared to remain in positive balance even on a low Ca intake. Andreasi (1955), in his studies on the feeding of a commercial dog meal to Beagles, found better retention of Ca, P and nitrogen at 12 weeks of age than in adults.

The view has been expressed that urolithiasis in dogs is a disorder of Ca and P metabolism. An analysis of the records of urinary calculi, conducted at the Royal Veterinary College, Stockholm, indicated a much higher incidence in chondrodystrophic breeds, such as Dachshunds and Pekingese, than in Airedales, Alsatians or Boxers (Krook & Arwedsson, 1956). It must, however, be emphasised that cystine calculi are not uncommon in some of the chondrodystrophic breeds, as well as in Dalmatians (see Bloom, 1954), and that the evaluation of any single factor must be regarded against the whole background.

Water

Over 30 years ago it was reported that there was great variation in the quantity of water consumed by individual laboratory dogs from day to day. The animals in question were not normally fed on Sundays, and on these days their water consumption was small. When the dogs were deprived of food for a number of days in succession, they drank more water daily than on foodless Sundays, but appreciably less than during days of normal feeding (Kleitman, 1927).

From the data in Kleitman's paper it may be calculated that, for dogs weighing 8 to 14 kg. (17½ to 30 lb.)—within which range consumption did not appear to be related to bodyweight—the mean consumption on weekdays averaged 352 ml., that on Sundays only 64 ml. and that during periods of fast 148 ml. The total water intake by the body was of course even lower during fasting, owing to lack of water obtained from the food itself, and Kleitman calculated it as from one-fifth to one-third of the normal. He believed that the marked decrease in the water intake in starvation was probably one of the causes of the gradual deterioration of the salivary conditioned reflex observed in that condition.

Despite this lowered intake in starvation, limited studies have indicated a marked increase in the antipyrine space of emaciated compared with normal dogs (Herrold & Sapirstein, 1952).

In very hot weather, especially out of the shade, water consumption may be doubled (Whitney, 1949, p. 81). According to Tarbin (1955) dogs consume larger volumes of water daily at higher environmental temperatures by taking more frequent drinks rather than by any change in the amount of water taken at each drink. A given dog appears to favour a characteristic size of drink that is not markedly affected by total food or water intake. As mentioned at Congress (Worden, 1959) adult dogs with kidney damage, presumably of the chronic interstitial type, will consume very long single drinks.

Vitamins

Although we have for some years been studying the utilisation and excretion of various vitamins by the dog, this is too lengthy a topic for consideration here. We have confirmed that small quantities of vitamin A are present in the urine of normal dogs (Worden, Bunyan, Davies & Waterhouse, 1955), although the levels (from about 2.5 to 50 I.U. per 100 ml.) are of a lower order than previously reported and we would regard the excretion of large amounts as indicative of a pathological condition.

In our studies on the B group (Worden, Waterhouse & Partington, 1952, 1954, 1955; Worden & Waterhouse, 1955; Worden, Waterhouse & Pulman, 1956) we have evidence of variation of utilisation with environmental temperature and, in the case of thiamine, a marked increase during pregnancy. The lability of thiamine, and its almost complete absence from the beef pemmican diet as used, led to deficiency in the field (see Taylor *et al.*, 1959). Greig (1953) has referred to deficiency of nicotinic acid, as well as of calcium and, possibly, riboflavin and vitamin D, in the regular diets of sheep dogs in Great Britain.

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II.—The Cat

BY

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AMONG common domestic and laboratory animals, the cat is perhaps the one about whose nutrition the least is known. This lack of knowledge has been frequently stressed in scientific papers (da Silva, 1950a; Allison, Miller, McCoy & Brush, 1956), and in veterinary reviews (Morris, 1953; Exley, 1958), and has been responsible for certain errors, of emphasis if not of fact (Coop, 1958). One of the reasons for this lack of information may be the difficulty so commonly experienced in attempting to breed cats under controlled conditions (Saunders, 1952: personal communication; da Silva, 1953: personal communication) though recently successful breeding colonies have been built up at this laboratory (Dickinson & Scott, 1956a), and at the M.R.C. laboratories at Mill Hill, London (Short, 1958: personal communication).

Cats are used frequently in physiological and pharmacological laboratories for acute and long-term experiments, and are often maintained on the premises for some time before being subjected to experiment; this, and the existence of a large and thriving food industry, catering specifically for cats, would in themselves be sufficient reasons for studying their nutritional requirements.

But apart from these considerations, cats belong to a family—the *Felidae*—which shows many interesting and peculiar metabolic features. For example, cats, and animals of closely related genera, have an unusually high requirement for protein (Dickinson & Scott, 1956b; Worden, A.; personal communication: high requirement for protein shown by mink), and thrive best on high fat diets (Gershoff & Hegsted, 1957). They are unable to utilise tryptophan in place of nicotinic acid (da Silva, Fried & de Angelis, 1952), or convert carotene to vitamin A (Gershoff *et al.*, 1957). Various members of the Felidae excrete a unique sulphur containing amino-acid, felinine (Datta & Harris, 1953); and the kidney tubules of the cat are capable, it is suggested, of excreting thiosulphate (Effersoe, 1949). The kidneys of the cat contain very high concentrations of vitamin A and E (Lowe, Morton & Vernon, 1957), although this is not directly associated with the known high level of cortical lipid (Sharman, Moore, Greaves & Scott: unpublished results).

Work in this laboratory has established mean weight gains and standards of reproduction of cats on a stock diet. The animals used in experiments (with the exception of a very few) were born and reared in the colony attached to this laboratory, and described by Scott (Dickinson & Scott, 1956a; Scott, da Silva & Lloyd-Jacob, 1957) and Cornelius (1952). The colony is now somewhat inbred; the stock was originally derived from domestic cats, of the London area. Stock diets used for cats in various laboratories have been reviewed by Scott (Scott *et al.*, 1957); the stock diet used in this laboratory consisted of a morning feed of full-cream irradiated milk powder with fortified cereal (Farex, Glaxo Ltd.) and tinned cat-food (Petfoods Ltd.), and an afternoon feed of cooked potato together with one of the following: minced cooked liver, cooked sea fish (white), minced cooked lights, or tinned cat-food. These alternative protein sources were used in a planned rotation, and the protein content of the diet was over 50 per cent. on a dry weight basis. The afternoon feed was regularly supplemented with dried yeast and dried grass powder, but cod liver oil was never used. The diet provided approximately 140 cal. per kg. cat per day (Dickinson & Scott, 1956a).

In view of the lack of basic information concerning the cat, it has been necessary to spend time in establishing various physiological data before embarking on a more ambitious programme of nutritional research. Determinations have been made (unpublished) of the haemoglobin concentration and total haemoglobin in the blood of kittens and adult cats, showing their variation with age in the normal animal. A method has been worked out for estimating the surface area of the cat from its weaned bodyweight (Greaves, 1957). Observations have been made on the protein requirements of adult cats involving individual nitrogen balances, and on the protein requirements of kittens, also on the defects of natural high protein diets such as meat and meat offals (Greaves, Scott & Scott, 1958, 1959a, b). Attempts have been made to determine the effects of heat treatment of a good mixed diet on growth and nitrogen balance and to construct and study the effects of feeding a purified diet based on casein. This paper summarises some of our findings concerning the nutritional requirements of kittens and cats.

Food Intake

Satisfactory growth, maintenance and pregnancy in the cat are bound up more closely with the total daily intake of food than with any other single factor. This is immediately related to the acceptability of the diet and the condition of the animal; in infections appetite frequently fails. It is clear that some animal protein foods, *e.g.* meat, meat offals, poultry, fish, are well-liked by many cats but it is also apparent that an individual adult cat habituated to one of these foods may refuse all others to the point of inanition. However, young kittens can be adapted readily to artificial or unusual foods provided these are introduced during weaning. Similar observations have been made on accustoming dogs to purified diets (Morgan & Garrison, 1933). The attraction of a food appears to lie partly in its scent and flavour (adults refusing a purified diet may eat it after a day or two by flavouring with Bovril); partly in its consistency, often a major factor in refusal to eat.

The effect of environment and especially the human element, is of greater consequence in nutritional experiments with cats than with rats and mice. Cats in our laboratory regularly show reduced intakes

* Based on work carried out by J. P. Greaves, M. G. Scott and Patricia P. Scott in the Department of Physiology, Royal Free Hospital School of Medicine, and Histology Division, Royal Veterinary College, London.

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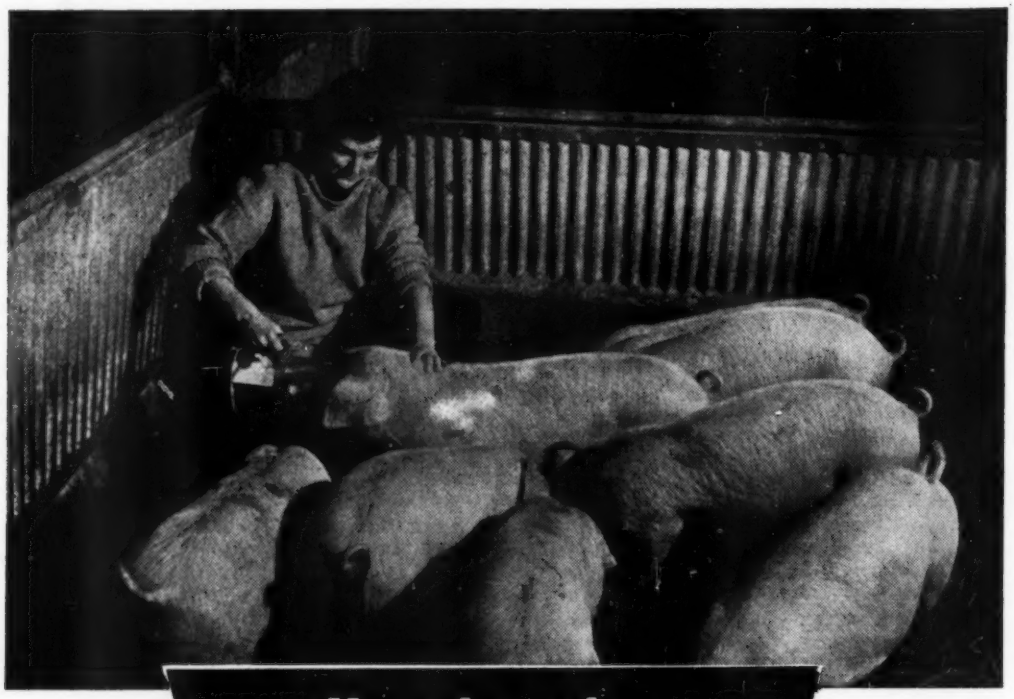

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Calories.

The calorie intake of cats is related to age and the nature of the diet. Using purified diets promoting satisfactory growth and adult maintenance there is general agreement that the calorie intake at 10 weeks is $\triangleq$ 160; at six months has fallen to $\triangleq$ 100; and at one year is 60 to 80 cals. per kg. cat per day. (Greaves, 1959; Miller & Allison, 1958; Krehl, Cowgill & Whedon, 1955). In our laboratory these values are associated with food conversion factors, *i.e.* daily wt. gain × 100 / cals. consumed per kg. cat per day. of 10 to 15 in growing kittens.

In view of the excellent growth and satisfactory reproduction we have obtained in cats fed exclusively on meat (supplemented with mineral salts) it would seem that carbohydrate *per se* is not required. Cooked potatoes and biscuit meal are acceptable, however, and are cheap providers of calories. Miller and Allison (1958) supplied the bulk of the carbohydrate as a mixture of dextrose and dextran. We have used sucrose with success in our purified diets in which it formed 28 per cent. and 36 per cent. of the dry weight.

Fat.

The readiness with which cats consume diets of high fat content has been observed by many workers and is consistent with their relatively high calorie requirements. The form in which fat should best be given, and the optimum proportion of saturated to unsaturated fat, has not been investigated. The total fat in successful purified diets varies from 10 to 30 per cent.; in our work we gave 22 to 25 per cent., using lard and arachis oil in various proportions.

Protein.

We have found, by nitrogen balance experiments, that adult cats require a minimum of 21 per cent. mixed fish and liver protein in a good mixed canned diet, in order to maintain nitrogen equilibrium. This corresponds to a daily intake of 5 g. protein per kg. bodyweight per day or 55 g. protein per m^2 surface area per day. This is in general agreement with Miller and Allison's (1958) figure of 0.5 g. N per kg. per day obtained by a different method, using purified diets. The requirement of the cat is high by comparison with other species, for example, adult human beings require 15 to 18.1 g. protein per m^2 per day (Hegsted, Tsongas, Abbott & Stare, 1946) and adult rats 3.6 to 7.6 per cent. protein (Bricker & Mitchell, 1947) in the diet, for nitrogen equilibrium, according to the type of protein fed. Moreover, the cat appears to require a high total dietary nitrogen to calorie ratio: for our mixed diet containing 32 per cent. protein this was 11.6 mg. N per Cal. and at the 21 per cent. protein level 7.5 mg. N per Cal. Our purified diets had ratios of 11 to 13 mg. N per Cal. Using mixed diet we found that the " true " digestibility of proteins was independent of their dietary level and approximated to 87 per cent.

Further experiments have confirmed our earlier observation (Dickinson & Scott, 1956b) that for normal growth kittens require more than 30 per cent. protein in a mixed diet. Experiments using purified diets have led to similar conclusions (da Silva, 1950, 1955; Krehl *et al.*, 1955; Gershoff *et al.*, 1957; Greaves, 1959), with the exception of those of Miller and Allison (1958) who used 25 per cent. casein. Measurements of food intake in our experiments suggested that the energy demands of the kitten were met on diets (*i.e.* appetite was maintained) containing less than 30 per cent. protein but weight gains fell below the normal expected values. Food conversion factors (see under calories) were between 8 and 9, on 32 and 39 per cent. protein in mixed diets, where the mean daily weight gain was 12 to 13 g. per cat per day. The conversion factors obtained with 35 and 45 per cent. casein on purified diets were between 10 and 13, indicating a similar order of efficiency of conversion to mixed diets. Some experiments in which crystalline lysine and methionine were used to supplement a diet containing 24 per cent. protein (inadequate for normal growth) failed to produce any evidence that a relative deficiency of these amino-acids is the cause of the high protein requirement of kittens.

Mineral Salts

Very little is known of the mineral requirements of cats. Salt mixtures incorporated into purified diets by other workers are usually at the 4 or 5 per cent. level (dry weight). However, Mendel, Hubbell & Wakeman (1937a, b) working on rats, showed that, by increasing the proportion of calcium in a salt mixture, many other constituents may be provided in amounts considerably below those commonly used. A mixture based on their findings fed at the 2 per cent. level provided the following elements:—

Mg. per 100 *g. dry diet*			*µg. per* 100 *g. dry diet*		
Ca	...	434	Mn	...	228
P	...	102	Cu	...	462
Na	...	55	Co	...	324
K	...	237	Zn	...	580
Fe	...	10·3	I	...	122
Cl	...	189	Al	...	19
S	...	9	F	...	678
Mg	...	20·7			

Although this salt mixture by itself had a Ca:P ratio of 4.28, in the complete diet the Ca:P ratio fell to 1.03, due to the high P content of casein. No signs attributable to mineral deficiencies of any kind were apparent even after many months on this salt mixture. When the calcium in this purified diet was reduced so that the Ca:P ratio was approximately 0.04, typical signs of bony dystrophy (osteoporosis or osteitis fibrosa, sometimes described as oesteogenesis imperfecta) appeared in growing kittens (Greaves, Scott & Scott, 1958, 1959a; Scott, 1959).

Feeding a natural diet low in iodine (raw heart

containing 10 to 80 μg. per 100 dry diet) has produced hyperplastic changes with increased weight in the thyroids of kittens, the severity of the change being related to the length of the time on the diet (Greaves, Scott & Scott, 1959b). This could be prevented or cured by giving kittens an additional 100 μg. iodine daily. We have also observed (Scott, Greaves & Scott, 1959c) that a low iodine intake in females will result in resorption of foetuses and abortions in middle and late pregnancy although oestrus and mating behaviour are normal. On the other hand, Krehl, Cowgill and Whedon (1955) noticed colloid follicular retention, with increased weight, in the thyroids of adult female cats reared and maintained on a diet containing 3,000 μg. iodine 100 g. dry diet, suggesting that this is too high an intake. We have evidence that the retention of calcium is related to the iodine content of the diet, *i.e.* calcium losses in urine and faeces were increased on a low iodine diet (Roberts & Scott, 1959).

Vitamins

(*i*) *Fat soluble.*

Actively growing kittens remained healthy on a purified diet providing 1,600 to 1,900 I.U. vitamin A per day, while kittens and adults receiving 250 I.U. per day on a purified diet, or 45 to 60 I.U. per day on a natural diet (raw heart) had, after a few weeks, low values for vitamin A in liver and kidney (Sharman, Moore, Scott & Greaves, unpublished results). Overt signs of vitamin A deficiency—poor, harsh coat with scabby areas, inflamed discharging conjunctiva, foul smelling mouth with inflamed gums and enlarged parotid ducts—took much longer to appear. In the case of the natural diet these appeared only in the second generation. These lesions (unlike ordinary infections) responded promptly to small doses of vitamin A, namely, 5,000 I.U. 3 times a week. Gershoff & Hegsted (1957) found that 2,500 I.U. vitamin A per 100 g. dry diet was sufficient to prevent the appearance of specific lesions in growing kittens. These workers confirmed the observations of Ahmad (1931) and Rea and Drummond (1932) that the cat can form little or no vitamin A from carotene.

So far, we have not seen any clear-cut instance of true rickets due to vitamin D deficiency in cats. Gershoff, Legg, O'Connor and Hegsted (1957) found that the addition of the equivalent of 70 I.U. vitamin D per day gave complete protection against rickets in young kittens given a high Ca-low P rachitogenic diet. They concluded that yong adult cats have a very low vitamin D requirement. Assuming a daily consumption of 50 g. dry diet per day the purified diet of Gershoff and Hegsted (1957) provided about 50 I.U. vitamin D per day. In our case we used 125 and 260 I.U. per day in purified diets, and thus undoubtedly exceeded the requirement of the cat.

The precise requirement for vitamin E has not been investigated. Presumably it would depend on the fat content of the diet in general, and on the level of unsaturated fats in particular. Clinical cases of steatitis ("yellow fat disease") have been described in kittens fed on diets (canned cat food, mostly fish, or frozen horse meat), which were high in unsaturated fatty acids and low in vitamin E (Cordy & Stillinger, 1953; Coffin & Holzworth, 1954; Munson *et al.*, 1958). Signs included listlessness, anorexia and difficulty in moving. Subcutaneous fat became progressively more firm to touch, and at autopsy was brownish-yellow in colour, sometimes flecked; mesenteric fat was usually deep yellow to orange. It may be significant that the perirenal fat of a kitten on purified diet I providing 0.26 mg. L-tocopherol acetate was yellowish, whereas on purified diet IV which contained the same amount of vitamin E but much less unsaturated fat, the fat of the kitten was creamy-white. It would seem desirable on the basis of experiments on mink (Lalor, Leoschke & Elvehjem, 1951) to feed at the level of 4 mg. per cat per day until further evidence of requirement is forthcoming.

(*ii*) *Water soluble.*

There are wide variations in the amounts of the "B group" of vitamins which various authors consider necessary for cats. For example, Gershoff and Hegsted (1957) fed thiamine at the level of 0.4 mg. per 100 g. dry diet, while Miller and Allison (1958) used 2.0 mg. per 100 g. Our experience suggests that actively growing 10-week-old kittens require not more than 0.4 mg. thiamine per day which agrees with da Silva *et al.'s* (1955) figure of 0.43 mg. per day. Specific signs of thiamine deficiency, namely anorexia, loss of weight and convulsions, have been well described by Everett (1944), Odom and McEachern (1942) and by Jubb, Saunders and Coates (1956). Inactivation of thiamine, to the extent that intake falls below requirement, is not uncommon in canned diets, signs appearing in adult cats which have received the diet alone for about 6 weeks (Fielden, personal communication).

Riboflavin provided by purified diets described in the literature ranged from 0.43 to 2 mg. per day in our most satisfactory diets the daily intake was 0.41 to 0.64 mg. riboflavin per cat per day—but this was probably well above the minimum requirement. Gershoff and Hegsted (1959), found that the requirement for riboflavin was related to the fat content of the diet; 0.2 mg. per 100 g. dry diet was inadequate on 26 per cent. fat, but sufficient when the fat was only 5 per cent. of the diet.

Comparisons between our own and other purified diets leads us to suppose that 2.6 nicotinic acid, 0.2 mg. pyridoxin and 1 mg. calcium pantothenate per kitten per day represent minimal requirements for growth.

The amounts of folic acid, 2 μg. per day and biotin, 0.1 mg. per day which we provided were much less than those of other workers; nevertheless, the blood pictures of our animals, in so far as they were investigated, remained normal. Da Silva *et al.* (1955) were unable to produce specific folic acid deficiency in kittens without the addition of sulpha-drugs to the diet.

We have observed inositol deficiency, resulting in a poor staring coat, with loss of hair down the back, and a fatty liver, on a purified diet. This was cured or prevented by the addition of 20 mg. inositol per 100 g. dry diet, representing 10 mg. inositol per cat per day.

Using our purified diet I, which did not contain choline, we obtained severe fatty infiltration of the liver. This condition was resolved by supplementation with 150 mg. choline per cat per day, and also by feeding 20 g. wet raw heart per day, which provided about 34 mg. choline per day.

Ascorbic acid was not provided in any of the purified diets used by ourselves or other workers and is almost certainly not required under normal conditions. Vitamin K has been included in purified diets in amounts ranging from 0.1 to 2.0 mg. per 100 g. dry diet. However, this substance was not intentionally added to our diets, and after more than a year there has been no indication of deficiency of this vitamin such as, for example, by a prolongation of clotting time.

Reproduction

The most exacting proof of the adequacy of a diet is its ability to support normal sexual maturation, reproduction and lactation. So far we have obtained maturation of male and female cats, fertilisation, and implantation on the best of our purified diets using the levels of food substances described in this paper. During the course of our work we have noticed that insufficiencies of protein, vitamin A, calcium or iodine have an adverse effect on reproduction.

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III.—The Food Manufacturer

BY

R. G. BOOTH

Petfoods, Ltd., Melton Mowbray

I WISH to touch on some of the problems which the manufacturer of canned and processed foods for dogs and cats has to face, and the ways in which these problems are met. In particular, I want to concentrate on raw materials; but before doing so, a few words on formulation.

We know, from extensive "purchaser" research (our nearest equivalent to "consumer" research, particularly as the purchaser of food for pets is nearly always the person who actually feeds the pet) that canned food is only rarely fed as an exclusive diet. When canned food is used, it is almost always supplemented (or perhaps "diluted" would be a more appropriate word) by a variety of materials, some of which, particularly in the case of the dog, are especially bought as food for the animals, but a quite large proportion of which arises as scraps, left-overs, crusts, etc. Therefore, to make sure of the overall adequacy of the animal's diet (and almost certainly the specially bought food will be blamed if any nutritional deficiency symptoms arise), it is essential to be generous in formulation in those items which might be in short or marginal supply. Similarly it is necessary to allow for the requirements of the most demanding among breeds.

In the course of time "compromise" formulae have been evolved which experience tells us are not

unsuccessful in general use. These formulae, rather naturally, demand constancy and uniformity in kind and quality of raw materials, and because animals are particular about such factors as freshness and flavour, these have to be looked after with special care.

When the canned animal food business was small, raw materials required at the rate of a few tons a week were a relatively simple problem. But now, with the production of a single firm running into tens of thousands of tons of product a year, and this production going on for 7 days a week, 24 hours a day, the securing of the right raw materials at the right time is a major operation.

Basic raw materials are meat and fish, and it is with these items that I would like to deal. They are the key to the formulation of satisfactory canned foods, and their quality must be beyond reproach because both dogs and cats are highly critical of any deviation from the degree of freshness which obtains for meat and fish for human consumption.

To deal with meat first, the major source of meat for dog food and meat-based cat food is the whale. Whalemeat, originally brought to this country as human food, did not find favour for reasons into which I need not go here. Fortunately the dog, being unable to read and therefore taking things at their face value, does not suffer any inhibitions about eating whalemeat provided it has been well preserved and is presented in an attractive form.

What, then, are the problems in securing good quality whalemeat? The first is that whaling was an industry which had centred around oil production for so long that the idea of large-scale meat production needed a lot of pressing. Continuity of a market for whalemeat was also important, as large capital expenditure is necessary for freezing, storage and refrigerated transport.

Large-scale whale catching is principally carried out in the Antarctic and over a limited period each year, so that the economics of meat production had to be gone into in great detail. Suffice it to say that over a period of years it has been made more and more evident to potential producers that there were advantages in bringing back fresh meat so that whereas once upon a time supply was limited to a few sources, there are now many sources of whalemeat open to the producer of foods for pets. My company, for example, draws supplies, or may shortly be drawing supplies, from whaling companies domiciled in Britain, Holland, Norway, Argentina, South Africa, Japan, Russia and elsewhere.

The second problem is one of quality of whalemeat—or whale steak as the material required may be properly termed. Only meat from Baleen whales is of interest, and only the meat lying immediately above and below the middle section of the backbone is used—meat from other areas is unusable because of excess of sinew or for other reasons. The whale must be fresh, and the meat sweet and unfermented. All this involves rigorous inspection at the point where the flensing and freezing take place.

The use of antibiotics shortly after harpooning has led in many cases to the production of more meat, and meat of better quality than heretofore; the antibiotic does not enter the meat, nor is it present on its surface, so that no "residual" problem arises. The bacteriostatic effect operates by inhibiting the action of the enteric flora, which frequently ceases to be contained within the gut after the penetration and explosion of one or more harpoons and their associated grenades. There is no problem of disease in whales, which appear to be exceptionally healthy mammals.

The third problem is this: having planned to select, freeze, transport and store at the necessary very low temperature one's whalemeat, how much should one buy or attempt to buy—because however well the manufacturer may be able to forecast requirements, the success or failure of any given whaling enterprise, be it factory-ship or shore based, is quite unpredictable.

This brief picture of the way in which whalemeat supplies have been developed is paralleled, in many ways, by other meats—liver, for example, may come from the Antipodes, Argentina and Ireland as well as from home production. The cereals used in pet foods, mainly wheat and rice, may come from Australia, Siam, Burma and the U.S.A. as well as from the U.K.

Turning now to another basic raw material for the industry; fish is used in tens of thousands of tons, and here the major quantity is produced by vessels operating from the U.K. The fish used, both white fish and oily fish, is that which is surplus to the requirements of the human food market—there is no difference whatever in kind or quality. On days when landings exceed the market requirements, surpluses are taken and either used immediately or frozen to provide buffer stocks against the days when there are shortages. Herring fishing, in any case, is seasonal, and stocks must be built up to allow production to continue during the off-season.

What has been said about the principal perishable ingredients in canned food for pets, and the fact that my Company, for example, has a freezing capacity of about 70 tons a day plus a 7,000-ton "deep freeze" cold store, provide an idea of the lengths that are gone to and the care taken to produce, as far as possible, standard products throughout the year and products in which quality receives just as much attention as it does in human food production.

Finally, it would obviously be a waste of time to go to considerable trouble and expense in the quest for high quality if processing of the product were to destroy or diminish seriously the qualities of the ingredients. Thus, processing is ordered in such a way as to conserve measurable nutrients as far as possible: in a few instances such as the occasional addition of vitamins, fortification is carried out to make sure of a satisfactory residual vitamin content.

Experiments on radiation sterilisation in lieu of heat treatment of cat and dog foods were carried out both using electron beam and cobalt 60, 4 years ago. While such sterilisation methods proved very

(*Continued foot of adjoining column*)

Current Literature

REPORTS

Annual Report on the Department of Veterinary Services of the Northern Region of Nigeria 1956-57.

The domestic livestock of the Northern Region of Nigeria consists of about 15 million goats, 4 million cattle, 2 million sheep and ½ million donkeys. A few pigs (47,000) and camels (3,000) complete the total. This livestock forms one of the Region's most important resources, for besides supplying all the territory's fresh meat it also provides valuable surpluses for export. During the 12-month period under review, for example, nearly 300,000 cattle worth £6 million, 30,000 sheep and goats, 10,000 tons of hides and skins worth £3 million, and 3,000 tons of dried meat were exported. The value of all these exports was of the order of £10 million. The cattle, sheep, goats and dried meat went to the Western and Eastern Regions of Nigeria; the destination of the hides and skins is not given in the Report.

These figures are sufficient in themselves to indicate how important the Veterinary Department is to the Colony. As yet its chief concern is still the control of dangerous livestock diseases and in his Report the Director of Veterinary Services, Dr. S. G. Wilson, C.B.E., M.R.C.V.S., gives a concise account of how the many problems involved are being met.

Control of trypanosomiasis again formed a major part of the duties of the provincial veterinary staff. The number of cattle treated has increased 7-fold in 5 years to reach in 1956/57, a new high level of nearly 600,000. This level is now embarrassingly high and the Director warns that not only will any further rise demand considerably more senior supervisory staff but also, and this is more important still, that further increases in the use of curative drugs followed by repeated reinfection will undoubtedly lead to the rapid development of drug-resistant strains.

Further attacks on the disease should therefore be directed as quickly as possible towards tsetse eradication in grazing areas and to the replacement of curative drugs by prophylactic treatments. A special section of the Department, the Tsetse and Trypanosomiasis Unit is engaged on the first problem and has already produced promising lines for the eradication of *G. morsitans*. Also preliminary trials with prothidium and ethidium-suramin under relatively severe *G. morsitans* challenge suggested that the former at 5 mg. per kilo intramuscularly afforded good prophylaxis against *T. vivax* and *T. congolense*.

The Food Manufacturer.—*Concluded.*

satisfactory in the matter of nutrient preservation, such bad flavours were produced as made the products quite unacceptable to both dogs and cats. These methods now await the discovery of suitable inhibitors to stop the formation of the characteristic and very undesirable " radiation " smell and flavour.

The continued presence of bovine pleuropneumonia in the north eastern province of Bornu poses a serious threat to the rest of the country. The rapid slide test with stained antigen is used to detect infected cattle. Reactors are slaughtered and the remaining cattle vaccinated with 5 c.c. broth culture vaccine and branded. Although neither the test nor the vaccine is completely reliable they are nevertheless useful weapons and plans are in hand to vaccinate in the remote parts of Bornu Province along Lake Chad where some 100,000 cattle graze throughout the dry season.

Although rinderpest outbreaks were frequent and widespread less than average losses were suffered. Some 31,000 cattle were involved of which about 9 per cent. died. The origins of many outbreaks were impossible to ascertain. The safest assumption was that in most cases the disease first originated in young calves under 1 year old. It appears, then, that despite the fact that over 13 per cent. of the total cattle population is vaccinated every year at a cost of some £40,000 there is little likelihood of the disease being exterminated unless all young calves can be immunised as soon as they become susceptible. This is not easy under the nomadic methods of husbandry practised by the Fulani cattle owners.

Blackquarter was widespread and accounted for some 500 deaths; about 700,000 cattle were vaccinated. Anthrax and haemorrhagic septicaemia were also present but caused much less mortality. In one outbreak of haemorrhagic septicaemia 2 clinical cases recovered with sulphamezathine treatment—whereupon owners of incontact cattle immediately refused vaccination!

Although tuberculosis is undoubtedly more widespread than was once thought its true extent is still obscure. This, too, is the case with brucellosis; actual abortions are relatively infrequent but where agglutination tests have been carried out significant numbers of positives have been obtained.

Babesia infections, anaplasmosis and heartwater occur in cattle and streptothricosis is responsible for serious economic losses in hides. Helminthiasis is widespread, especially in sheep and goats, and although there was a marked increase in the use of anthelmintics throughout the Region during the year the Director states that this service is still too low and requires more attention in future. In addition to helminthiasis other conditions seen in sheep or goats included caprine pleuroneumonia, coccidiosis, anthrax, heartwater and foot-rot. Losses in these animals are often accepted by the owners as inevitable and it is consequently difficult to obtain a true disease picture in these species.

Rabies, present in at least 8 Provinces, was confirmed in 17 dogs and cats; other cases probably occurred as well. Flury strain vaccine prepared at the Federal Veterinary Laboratory, Vom, was used on nearly 3,000 dogs.

Poultry diseases offer a wide field for investigation. The new poultry laboratory at Kaduna was approaching completion by the end of the year and

as soon as it is ready it will be possible to carry out proper surveys and diagnosis. The present indications are that Newcastle disease, coccidiosis, fowl pox, fowl typhoid and probably fowl cholera are all responsible for severe losses. Spirochaetosis is a common disease in both fowls and turkeys but penicillin affords an excellent cure.

The 3 livestock investigation centres at Bulassa, Katsina and Biu were maintained and work continued on the relatively small herds of Gudale and Red Rahaji cattle, Sokoto Red goats and Ouda sheep kept on them.

The Report has some good photographs of indigenous stock and concludes with 6 appendices of statistics; it is unfortunate that in some instances the figures do not tally with those quoted in the text. This, however, is a minor criticism of a Report which gives a good but modest account of the very important contributions the officers of the Department are making to the welfare of the native peoples of the Region. W. E. L.

State of Israel : Report on the Division of Infectious Diseases, Department of Veterinary Services and Animal Husbandry, for the year 1958.

In the introduction to his Report for 1958, the Chief of the Division of Infectious Diseases, Mr. Y. S. Goor, M.R.C.V.S., points out that Israel is faced with special difficulties because of her very long boundary with neighbouring countries in which the standard of veterinary services is not high and because also the present political conditions do not enable his Division to learn of disease outbreaks as soon as they occur in those countries. Despite these drawbacks Israel has attained a high standard of animal health and during the past 4 years has eliminated a number of diseases which are still prevalent in other countries in the Middle East, for example, rinderpest, contagious bovine pleuropneumonia, glanders, epizootic lymphangitis, dourine and equine encephalomyelitis.

As in previous years foot-and-mouth disease again invaded the country. It was first detected in March near the Jordan border and outbreaks occurred and spread during the rest of the year. In general the cases were mild and losses were slight and it was not necessary to resort to slaughter for control. Some confusion existed at first as to the type of virus responsible and most of the grade stock in the country was vaccinated with type A, O and C, either alone or in combination. Eventually it was established that in all outbreaks except one the "Asia 1" virus was responsible. The appearance of this type virus in the country is viewed with concern as there is at present no vaccine available against it.

Efforts towards the eradication of bovine tuberculosis were continued. It appears from the Report that in some parts of the country herd testing is compulsory but that in others the option is left to owners. During the year some 88,300 cattle in all the 14 districts of the country were tested; 1.4 per cent. gave specific infection reactions; 4.7 per cent. were required for re-test. Johne's disease is comparatively rare in cattle and does not present an economic problem. During the year, however, it was found in a number of sheep flocks; it is feared that the evaluation of TB tests in cattle might be rendered difficult on farms where there are infected sheep.

Anaplasmosis, piroplasmosis and theileriasis continue to be the most important veterinary disease problems in Israel. Immunisation has greatly reduced the incidence of theileriasis in affected areas, and immunisation with *Anaplasma centrale*, originally obtained from South Africa but now produced at the Israel Veterinary Institute, has also proved of great value. Over 27,700 cattle were so protected against anaplasmosis and 6,400 against theileriasis. No successful immunisation against piroplasma, however, has yet been achieved and this group of parasites caused serious losses during the year, whole herds of imported beef cattle becoming affected. "Cocktail" injections (Anaplasma, Babesia and Babesiella) were tried on 1,900 Yugoslavian cattle in Haifa quarantine station.

Because of extensive S.19 vaccination bovine brucellosis is no longer of economic importance. There was evidence, however, that human cases of sheep and goat brucellosis were on the increase. Another medico-veterinary problem which seems to be increasing is leptospirosis; several beef herds as well as sheep and goat flocks were shown to be infected.

Anti-anthrax vaccinations totalled 211,200 of which 104,000 were for sheep and goats of the Bedouin in the Negev.

Vibriosis and trichomoniasis have been diagnosed but do not appear as yet to be widespread. As about 90 per cent. of the dairy cows are inseminated artificially vibrosis is not a serious problem at present in dairy herds.

Diseases met with in sheep during the year included agalactia, listeriosis, malignant oedema, enterotoxaemia and sheep pox.

Although the number (37) of animal rabies cases in 1958 was a good deal less than in each of the previous 4 years the disease is still a serious public health problem. This must be a great disappointment to the authorities after the progress made towards its eradication in 1951-53 when the incidence was brought to an extremely low level. During 1958 some 11,700 dogs—a very small percentage of the total dog population—were vaccinated, 23,000 dogs and cats destroyed and tens of thousands of pieces of poisoned bait laid for jackal. It is stated that lack of suitable equipment at the Veterinary Institute made it impossible to produce sufficient vaccine when needed.

The Division of Infectious Diseases is also responsible for the control and quarantine of imported animals. During the year 10,000 cattle, 1,000 horses, 330 mules and donkeys, 1,500 sheep and 17,000 day-old chicks and ducklings were imported from Great Britain, U.S.A., Holland, Turkey, Yugoslavia, Poland, Finland, Hungary, Australia and Cyprus.

W. E. L.

News and Comment

FLORIDA VETERINARY CONFERENCE

The 3rd Annual Florida Conference for Veterinarians will be held at the University of Florida on April 30th and May 1st, 1960. The programme of the Conference will consist of a symposium on Diseases of Young Animals. Thirty-five subjects will be covered by workers in the fields of management, nutrition and diseases of puppies, kittens, calves, pigs and foals. Human paediatricians and research workers in the basic sciences will cover appropriate subjects. All veterinary surgeons are invited to attend.

UNIVERSITY NEWS

Bristol

The following students passed the final examination for the degree of B.V.Sc. (Section I):—

Blake, K. J.; Burrows, C. J.; Davies, H. E.; George, D. B. L.; Jenkins, C. T.; Morris, J. M.; Peace, M. D.; Perry, M. D.; Sanders, K. J.; Sebesteny, A.; Skelton, W. E.; Stoker, J. W.; Turner, P. J.; Wescott, Miss M.; White, K. B.; Whittard, L. M.; Wilkinson, K. R.; and Young, R. C.

The following students passed the final examination for the degree of B.V.Sc. (Section II):—

Davies, G.; Parris, J. C.; and Vadden, M. J.

Liverpool

DEGREE OF B.V.SC.

Second Examination, Part I

(Veterinary Anatomy, including Histology and Embryology)

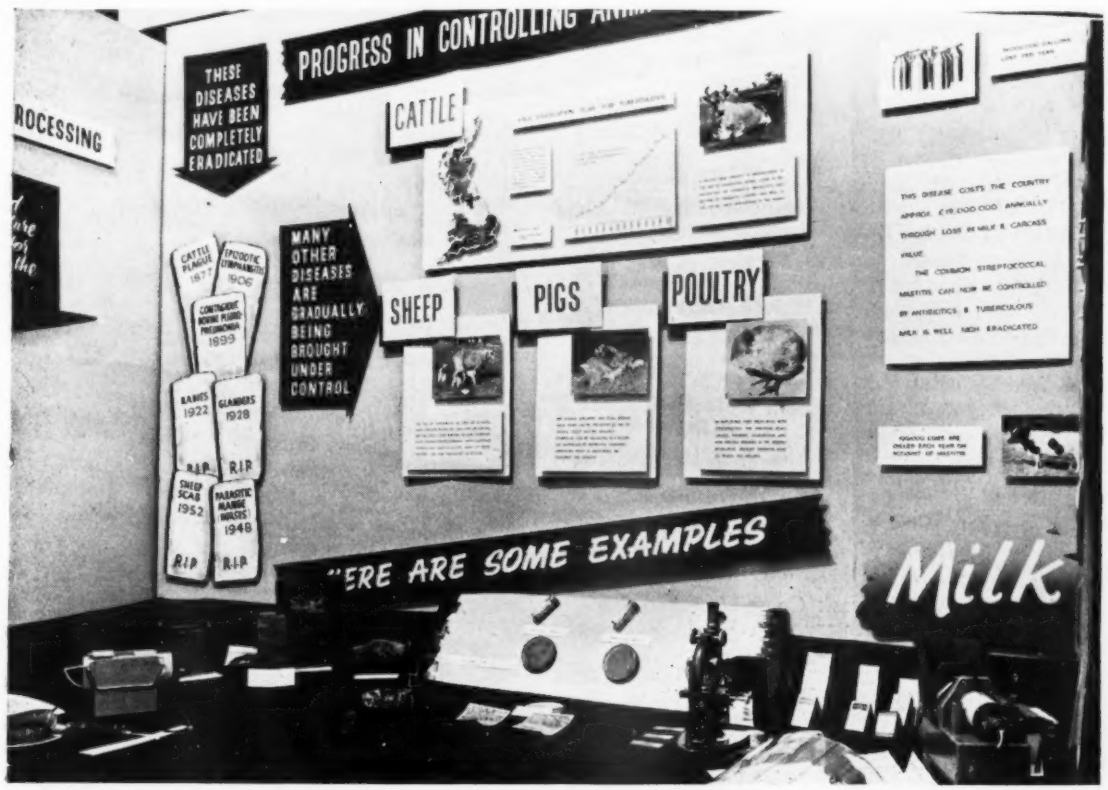
Aldridge, Margaret C.; Bardgett, P. L.; Bradley, W. A.; Cope, B. I.; Davies, G. E. G.; Entwistle, M. P.; Fabry, A.; Gardner, W. B.; Gooderham, K. R.; Hall, Elizabeth; Hallows, B. J.; Hardy, Elizabeth A.; Hilton, D. W.; Jones, R. T.; Jones, T. O.; Llewellyn, C. A.; Mohammed, I.; Moore, J. C.; Mudd, A. J.; Newcomb, R.; Pierrepoint, C. G.; Pulley, Norma M.; Riffkin, G. G.; Rutherford, R.; Sopronfalvy, M. J.; Summers, D.; Taylor, J. K.; Williams, H. G.; and Williams, M. H.

Second Examination, Part II

(Physiology, including Biochemistry)

Bardgett, P. L.; Bradley, W. A.; Entwistle, M. P.; Fabry*, A.; Gardner, W. B.; Gooderham, K. R.; Hall, Elizabeth; Hallows, B. J.; Hammonds, Patricia; Hardy, Elizabeth A.; Hilton, D. W.; Jones, T. O.; Llewellyn, C. A.; Mohammed, I.; Moore, J. C.; Mudd, A. J.; Newcomb, R.; Pierrepoint, C. G.; Pulley, Norma M.; Rawson, B. C.; Rutherford, R.; Sopronfalvy, M. J.; Strong, M. G.; Summers, D.; Taylor, J. K.; and Williams, H. G.

* Passed with Distinction in Biochemistry.



This photograph gives a general view of the profession's exhibit at the conversazione organised by the Parliamentary and Scientific Committee. This took place on December 9th, 1959 and was reported in THE VETERINARY RECORD on December 19th.

R.C.V.S. OBITUARY

We record with regret the death of the following member of the profession:—

WOOD, James, at Crosshouse, Corbridge, Northumberland on December 25th, 1959, aged 38. James Wood graduated Royal (Dick) Veterinary College, Edinburgh on July 12th, 1945.

HEARDER, Mary Isabel, of 27 Castle Street, Farnham, Surrey. Graduated Glasgow, July 16th, 1938. Died suddenly on December 28th, 1959.

COMING EVENTS

January

6th, 7th and 8th (Wed., Thurs. and Fri.). Committee and Council Meetings of the Royal College of Veterinary Surgeons at 10 Red Lion Square, London, W.C.1.

7th (Thurs.) Meeting of the Shropshire Veterinary Club at the Oaks Hotel, Shelton, Shrewsbury, 8 p.m.

8th (Fri.) Meeting of the Scottish Regional Group of the A.V.T. & R.W. in the Royal (Dick) School of Veterinary Studies, Edinburgh, 10.30 a.m.

12th (Tues.) Meeting of the B.V.A. Technical Development Committee at 7 Mansfield Street, London, W.1., 10.30 a.m.

13th (Wed.) Meeting of the Southern Counties Veterinary Society at the Royal Hotel, Winchester, 7.30 p.m.

Joint Meeting of the Society of Practising Veterinary Surgeons with the Southern Counties Veterinary Society as listed above.

20th (Wed.) 11th Anniversary Dinner-Dance of the University of Bristol Centaur Society at the Berkeley, Clifton, Bristol.

23rd (Sat.) Annual General Meeting of the East Anglian Pathologists' Club at the School of Veterinary Medicine, Madingly Road, Cambridge, 2 p.m.

February

3rd (Wed.) Meeting of the Southern Counties Veterinary Society at the Royal Hotel, Winchester.

5th (Fri.) Annual Ball of the Royal (Dick) School of Veterinary Studies in the Assembly Rooms, George Street, Edinburgh, 9 p.m.

BRITISH VETERINARY ASSOCIATION

Quarterly Meetings in London

Wednesday, January 20th, at 7 Mansfield Street.

10 a.m. Farm Livestock Committee.
11.30 a.m. Parliamentary and Public Relations Committee.
2.15 p.m. Veterinary State Medicine Committee.
4.30 p.m. Home Appointments Committee.

Thursday, January 21st, at 7 Mansfield Street.

10 a.m. Small Animals Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, January 22nd, at Connaught Rooms, W.C.2.

10.15 a.m. Council Meeting.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ayr. Hallrig Farm, Tarbolton, Mauchline (Dec. 22).
Bucks. Lovell Wood Farm, Lillingstone Lovell (Dec. 23).
Cumbs. The Beeches, Lamonby, Skelton, Penrith (Dec. 21).
Dumfries. Castlemains, Sanguhar (Dec. 18).
Hants. Manor Farm, Grateley, Andover (Dec. 23).
Lancs. Holme Park, Holme, Carnforth (Dec. 21).

Foot-and-Mouth Disease

Gloucs. Harrow Hill, Drybrook (Dec. 20).
Herts. Hormead Hall, Great Hormead, Buntingford (Dec. 28).
Warwicks. Webbs Green Farm, Quinton, Birmingham 32 (Dec. 19).
Worcs. Seed Farm, Cradley, Malvern (Dec. 20); Egghill, Droitwich (Dec. 23).
Yorks. St. James Abattoir, Bradford (Dec. 22); Lower Bracken Farm, Shelf, Halifax (Dec. 26).

Fowl Pest

Bucks. Mills Farm, Mill Lane, Weston Turville, Aylesbury (Dec. 19); 81, Aylesbury Road, Aston Clinton, Aylesbury (Dec. 25).
Cambs. 5, The Borough, Aldreth, Haddenham, Ely; Brickmakers Lane, Doddington, March (Dec. 18); 26, Curt Terrace, Chatteris; Norwood Road, Allotments, Wisbech Road, March; Pond Farm, Witcham, Ely; Woodcote, Harston; 6, Angwoods Lane, Chatteris (Dec. 19); Smallholding, Station Road, Willingham; 13B, Bridge Street, Chatteris (Dec. 21); Roselea, High Street, Meldreth (Dec. 22); 24, Norwood Road, March; 26, Peyton Avenue, March; 108, High Street, Chatteris; 61, High Street, Chatteris (Dec. 23); 14, Barristead Close, Wilburton, Ely; Hill Top Farm, Harston; 8, Dock Road, Chatteris (Dec. 24); Wisbech Road, Outwell, Wisbech (Dec. 25).
Derbys. Orchard House, Calow Green, Chesterfield (Dec. 20).
Durham. 15, Windsor Terrace, East Herrington, Sunderland (Dec. 21); Barron Quay Allotments, Castletown, Sunderland; Back Barrington Street, Monk Wearmouth (Dec. 22).
Essex. Hillside P.F. Duckwynds, Billericay (Dec. 22); Braemar, Mill Hill Drive, Billericay; Great Baddow Court Poultry Farm, Great Baddow, Chelmsford (Dec. 23); Rochett Farm, Park Lane, Ramsden Heath, Billericay (Dec 24); Riverside, Lodge Lane, Collier Row, Romford; 2, Parsonage Cottage, Park Lane, Ramsden Heath, Billericay (Dec. 25).
Hants. Nutley Farm, Broughton, Stockbridge (Dec. 21); Brightside, Salisbury Road, Broughton, Stockbridge (Dec. 22).
Herts. Lye End Farm, Sandon, Buntingford (Dec. 20); Cosy Corner, Flaundon Lane, Bovingdon, Hemel Hempstead; Hall Farm, Broadfield, Buntingford (Dec. 22); Hyde Hall, Sandon, Buntingford (Dec. 24).
Hunts. The Orchard, Wyton (Dec. 23).
Kent. Sharps Place, Bough Beech, Edenbridge (Dec. 19); Fleet Farm, Smarden, Ashford (Dec. 21); Hale Farm, Chiddingstone, Edenbridge (Dec. 22); Beddington Green Farm, Smarden, Ashford (Dec. 23).
Norfolk. Elmadale, Saxthorpe, Norwich; Point House Farm, Whitwell, Norwich; Low Common, South Lopham, Diss; Hill Tree Farm, Wymondham; Upgate Villa, Swannington, Norwich; Church Street, Kenninghall, Norwich; Mill House, Long Stratton, Norwich (Dec. 18); Hedges Farm, Shipdham, Thetford; The Old Egg Packing Station, Heydon, Norwich; Horse & Groom Public House, Tunstead, Norwich; Elmadale Farm, Saxthorpe, Norwich; Great Witchingham Hall, Norwich; Libya, Shelfanger, Diss; Newhouse Farm, Oby, Ashby with Oby; 42, Upper Sheringham; Stratton House, Mattishall, Dereham; Crown Farm, Fersfield, Diss (Dec. 19); The Cottage, Hall Lane,

Hardwick, Norwich; The Hill, Swanton Abbot, Norwich; Shop Farm, Fersfield, Diss; Nursery Buildings, East Dereham; Poplar Tree Farm, Fersfield, Diss; 12, Church Road, Gorleston, Gt. Yarmouth; 45, Fairstead, Scottow, Norwich (Dec. 20); Hollow Dene, Little Ryburgh, Fakenham; Post Office, Tuttington, Norwich; Mill Farm, Salhouse, Norwich; Dumpling Green, Dereham; Beech Farm, Skeyton, North Walsham; Lilac Farm, Bunwell, Norwich; Brick Yard Farm, Hevingham, Norwich (Dec. 21); Smugglers Lane, Reepham, Norwich; Woodhouse Farm, Wood Dalling, Norwich; St. Anns, Station Road, Salhouse, Norwich; Old Brewery House, Reepham, Norwich; The Grange, Redgrave, Diss; Golders Cottage, Sloley, Norwich; Striken Cottage, Scottow, Norwich; Ducks Farm, Bressingham, Diss; 16, Nursery Buildings, East Dereham; Holme House, Norwich Road, Salhouse, Norwich (Dec. 22); Bury Road, Wortham, Diss; Norwich Road, Cawston, Norwich; Bungalow Farm, Upperstoke, Holy Cross, Norwich; White Lodge, Chapel Street, Shipdham, Thetford; Mill Farm, Toftwood, Dereham; Church Farm, Shelfanger, Diss; Butterfly Hall, Attleborough; Green Farm, Yaxham Road, Dereham; Pump Farm, Carleton Rode, Norwich; Allotments Near Church, Horstead, Norwich (Dec. 23); King's Farm, Shotesham, Norwich; Turkey Farm, London Road, Attleborough; Riverside Farm, E. Tuddenham; 18, Hill Crest, Great Ryburgh, Fakenham; Orchard Farm, Itteringham, Norwich; General Stores, Seething, Norwich; Mill House, Barton Road, North Walsham; Bed Farm, Denton, Harleston; Pounds Corner, Hevingham, Norwich; (Dec. 24); West End Farm, Shipdham, Thetford; 3, Council Houses, Shelfanger, Diss; The Holmstead, E. Gate Street, North Elmham, Dereham; Holmleigh Poultry Holding, Melton Road, Wymondham; East Farm, Upper Stoke, Holycross, Norwich; Old Queen, Worthm, Diss; Hazeldene, Caistor Street, St. Edmunds, Norwich; The Police House, Framlingham Earl, Norwich; The Poultry Farm, Framlingham Earl, Norwich; Southrepps, Norwich (Dec. 25).

Northants. 29, Cromwell Road, Peterborough (Dec. 21).

Notts. Hill House Farm, White Post, Farnsfield, Newark; Eastfield, Edwinstowe, Mansfield; North Laiths Farm, Wellow Road, Eakring, Newark; Deerdale Lane, Bilsthorpe, Newark (Dec. 18); Grange Farm, Walesby, Newark (Dec. 19); Firs Farm, Walesby, Newark (Dec. 20); 218, Longdale Lane, Linby (Dec. 21); Main Street, Walesby, Newark; Ivy Cottage, Main Street, Walesby, Newark; Furze Court Farms Ltd., Walesby, Newark (Dec. 22); Inkersall Farm, Bilsthorpe, Newark; Oakham Poultry Farm, Walesby, Newark; Robin Hood Farm, Bilsthorpe, Newark (Dec. 23); South Forest Farm, Edwinstone, Mansfield (Dec. 24).

Suffolk. Mill Farm, Wyverstone, Stowmarket; Kenny Hill Poultry Farm, Kenny Hill, Bury St. Edmunds; Rookery Farm, Old Newton, Stowmarket (Dec. 18); Victoria Mill Piggery, Swilland, Ipswich; 10, Council Houses, Wickham Skeith, Eye; 136, Thwaites Road, Wickham Skeith, Eye; Akenham Hall, Akenham, Ipswich; Roughlands, Lakenheath; Lowland Beck Row, Bury St. Edmunds; Willow Farm, Hedenham, Bungay (Dec. 19); Malbing, Harting Road Station, Roundham (Dec. 20); Redingfield Road, Occold, Eye; The Laurels, Kenton, Stowmarket; 8, Back Lane, Badwell Ash, Bury St. Edmunds; 2, Back Lane, Badwell Ash, Bury St. Edmunds; 5, Council Houses, Occold, Eye (Dec. 21); Beech Green Farm, Bedingfield, Eye; Thatched Cottage, Hardwick, Bury St. Edmunds; Rockison, Westley Road, Thornham All Saints, Bury St. Edmunds; Manor Farm, Coddenham, Ipswich; Abbots Farm, Kirby Cane, Bungay; Willow House, Mellis, Eye (Dec. 22); Coppings Farm, Henley, Ipswich; Burnt House Farm, Rishangles, Eye; Marshfield, Snape, Saxmundham (Dec. 24); Wessere Farm, Haughley, Stowmarket; Post Office Stores, Badwell Ash, Bury St. Edmunds; The Causeway, Occold, Eye (Dec. 25).

Sussex. 3, Whitechapel Row, Threecups, Heathfield (Dec. 18); 276, Hangleton Road, Hove (Dec. 23).

Worcs. Poultry Houses, Badsey Lane, Wellersey, Broadway (Dec. 20); Hopcroft, Cleeve Prior, Evesham (Dec. 21).

Yorks. Cavendish Square, West Handley, Sheffield (Dec. 20).

Swine Fever

Beds. Rectory Farm, Upper Stondon and Hoo Farm, Meppershall, Shefford (Dec. 22).

Ches. Roughill, Marlston-cum-Lache, Chester (Dec. 22).

Devon. Factory Lane, Newton Poppleford; Little Woodhayes Farm, Cotleigh, Honiton (Dec. 22); Kersbrook Farm, Budleigh Salterton (Dec. 24).

Dorset. Clannia, Chickerall, Weymouth (Dec. 22).

East Lothian. Skedsbush, Gifford, Haddington (Dec. 22).

Essex. Park Gate Farm, Little Clacton (Dec. 21).

Hants. Vicarage Farm, Crowd Hill, Fair Oak, Eastleigh (Dec. 18).

Lancs. No. 12 Holding, Fallowfield Estate, Manchester; No. 19 Holding, Fallowfield Estate, Manchester.

Norfolk. Manor Farm, Drayton, Norwich (Dec. 18); Fengate Farm, Marsham; Street Farm, Poringland, Norwich (Dec. 21); The Limes, Silfield, Wymondham (Dec. 22).

Oxford. Hill Farm, Chinnor (Dec. 23).

Salop. 9 Bent Loat, Minsterley, Shrewsbury; Grange Farm, Westbury, Shrewsbury (Dec. 23); Keepers Cottage, Wotherton, Chirbury (Dec. 24).

Somerset. Box Cottage, Keinton Mandeville, Somerton (Dec. 21).

Staffs. Claverley Farm, Claverley, Wolverhampton (Dec. 18).

Warwicks. Balham Farm, Packhorse Lane, Hollywood, Birmingham, 30 (Dec. 18).

Yorks. Mill Farm, Thornton (Dec. 21).

Some Clinical Aspects of Cardiovascular Disease in Cats and Dogs

We are asked to say that this paper by Miss J. O. Joshua, published last week, was originally delivered as a lecture to the Southern Region of the British Small Animal Veterinary Association at Winchester on May 9th, 1959.

NOTIFIABLE DISEASES

Current outbreaks of foot-and-mouth disease seem to be on the wane. Restriction of movement orders in a number of areas have been withdrawn, or contracted, and the only new cases reported during the closing days of last month have been in existing controlled areas.

Twenty-eight cases were confirmed during the first 20 days of December making the year's total 41.

Mr. John Hare, the Minister, said in a written reply that of the nine confirmed primary outbreaks of foot-and-mouth disease six had been attributed to infection from imported meat.

Fowl pest continued to spread in Norfolk and Suffolk and the Ministry reported that 2,750,000 birds had been slaughtered since October 1, and that compensation payments were estimated at about £2 million. A further one million birds were slaughtered during the first nine months of the year. Total outbreaks for the year number more than 1,849; nearly 500 cases were confirmed during the first three weeks of December.

During the same period 80 cases of swine fever were reported, making the total for the year 1,276.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

A Veterinary Television Talk

Sir,—In a recent issue of THE VETERINARY RECORD, you reminded us that we might find useful a talk given by a veterinary surgeon on the B.B.C. television programme "Farming."

Television programmes of this kind seem to impress and influence people greatly, and when the listening audience of one specialised section of the community is as high as 80 per cent., the programme wields enormous power.

The speaker, therefore, has a fair responsibility when he gives these talks, and in the eyes of many of his listeners he represents the profession, though he would be the last to claim this.

However, the fact remains that what he says on bovine parturition is taken to heart and acted upon by many farmers, and since this gentleman is a good actor as well as a veterinary surgeon his influence may be as great as his enthusiasm.

Since you, Sir, told us that we might find the talk useful, may I ask in what sense you meant this to be? It may have been that it was useful for us to know accurately what was said and in this I would agree with you. On the other hand did you mean that we might have found it useful in a professional respect?

I find it alarming that one man is allowed to hammer home facts to such a large audience when these so-called facts are not confirmed generally. Indeed, I feel that the broadcaster's general argument on parturition in the bovine animal is nonsense, and in this I doubt if I am alone.

If we are to have a professional man stating his opinions to such a large percentage of our clients, then let us have some form of professional criticism at the same time, or at least some form of discussion.

Yours faithfully,

D. H. PHILLIPS.

2 Horsley Hall,
Eccleshall,
Stafford.

December 29th, 1959.

"Progress"

Sir,—We are informed repeatedly by Press and other agencies of the "progress" being made by scientific discoveries, and I am in no position to contradict this information if one simply acknowledges "progress" as a "going forward."

Progress I consider as advancement towards some goal, and the goal of the veterinarian is the elimination of diseases and conditions which intervene in the normal development of our domestic and wild animals, birds, etc., resulting in unhealthy bodies and premature death. To combat disease the older practitioner was taught the art of assisting natural healing, producing immunity by means of the artificial stimulation of the system resulting in antibodies, and general hygiene.

If this reflects some of the more successful attempts at "progress" up to a decade or so ago, can we say that more recent attempts, though positive at the beginning, cannot possibly be maintained under such lax control as appears to exist to-day? Already we are discovering serious set-backs to the over-free use of antibiotics—produced, perhaps unfortunately, too cheaply. One has only to think of the antibiotic-supplemented feeding-stuffs used *ad lib.* because they—incidentally—fatten pigs in a hurry! When treatment of these "antibiotic intakers" became necessary the former drug of choice refused to work, and even went further, I believe, by masking the presence of notifiable diseases.

We have all read about the startling discovery (just in time) that many of us were about to be chronically and seriously poisoned by arsenic because this deadly scheduled poison was being liberally sprayed over our orchards and fields.

Implants and "chemicalised" feeding-stuffs are additional means of furthering "progress," with cattle aborting from innocently eating food contaminated with synthetic hormones passed to them from the manure of bullocks. Twinning in theory, and perhaps up to date, is still "progress" on the right line, but perhaps with the signals out of order. Lastly, there are the farmers who are being encouraged to "do-it-yourself," being offered syringes and the "know-how," and thus by-passing the profession who formerly gave their considered opinion and advice—and who are sitting down to this effrontery.

Patent medicines have always been with us, but their sale to all and sundry is fast becoming a free for all in the dispensing world. If the farmer will not come to town then the vans go to him. Whilst our eyes have been so focused on the atom bomb, and our ears trained to catch the expression "summit talks," slipping right under our noses (which cannot smell them) are the attempts mentioned above to make a mockery of progress against disease for the sake of commercialism.

Who will gainsay that we are not tampering with nature? I was taught that we should assist nature otherwise she would bring us to our knees; and I seriously consider that the genuflection is nearer at

hand than we might fondly imagine unless stricter control is adopted all round.

Familiarity breeds contempt, and I believe that contempt is here through familiarity.

Yours faithfully,

12 Severn Street, R. J. A. SWIFT.
Welshpool, Mont.
December 21st, 1959.

Asphyxiation in Cattle

Sir,—I have been interested in recent correspondence on this subject, particularly in the letter from Dr. Ian Macadam. Some years ago I witnessed a case of deliberate asphyxiation in the same district of Tanganyika as that quoted by Dr. Macadam.

In a remote native village I observed what appeared to be a fresh bovine carcase. As district veterinary officer I hastened to investigate the case. I found a very old and emaciated cow almost at the point of death. Around the muzzle, just behind the nostrils, a leather thong had been bound tightly. Another strong leather band had been drawn very tightly around the neck high up in an effort to constrict the upper portion of the trachea. The nostrils had been packed tightly with fresh leaves, mud and other waste matter. There had been no signs of a struggle, nor of any form of distress revealed from the eyes. The condition of this old cow confirmed the natives' story that she was no longer able to rise owing to senility and debility. They were thus following the traditional practice of slaughter by asphyxiation, for consumption of the carcase. As the animal was so deeply unconscious, and obviously beyond recovery, I considered it more humane to permit completion of the asphyxiation.

On a few occasions subsequently, residents in the territory confirmed this as an old-established native practice.

Yours faithfully,

Southwick, R. S. KYLE.
Trowbridge,
Wilts.
December 18th, 1959.

Progesterone and Pyometra in the Cow

Sir,—Mr. Dawson wishes to know more about the anoestrous ovaries I found in this type of pyometra. *Per rectum* they felt typically anoestrous, *i.e.* small, equal in size, regular and firm, with neither cyst nor corpus luteum present. Those re-examined at the time of treatment were still anoestrous.

If Mr. Dawson re-reads my letter carefully, he will find that there is no suggestion that the condition described is necessarily associated with cystic ovarian disease. However, I would not hesitate to use progesterone in the presence of a cyst if a pyometra were present having a discharge of the type I recorded.

I do not define all conditions showing "whites" as pyometra. In my opinion pyometra implies a persistent accumulation of a purulent discharge within the uterus other than in the normal involution period after parturition with or without a vaginal discharge. Any "pyometra" not enlarged to the size of a 9 weeks' pregnancy or more I would regard as suspect until proved by later developments, *i.e.* on re-examination after 1 or 2 periods of a week of more the "pyometra" is still as large or larger. In fact in none of the cases reported was the uterus smaller than a 10-week pregnancy when first examined; one at least the size of a 12-week pregnancy. I would be surprised to meet more than 6 cases a year in routine practice with a fair amount of routine infertility work, unless I had an outbreak of trichomoniasis. Another practice in this area reports a similar incidence. Perhaps, however, there is a regional difference and we are extremely fortunate in our situation!

Yours faithfully,

12 Landguard Road, C. M. GOULD.
Southampton.
December 27th, 1959.

Twin Calving

Sir,—The description of the sequelae produced by a multiple pregnancy as described by H. Bell in THE VETERINARY RECORD dated December 19th, interests me, as it brings to mind a case of quadruplets I attended in Yorkshire some years ago. I was called at about 4 p.m. to a cow in good condition which had shown signs of impending calving since 11 a.m. No water bladder had been noticed, but on examination, 2 calves were found to be "embracing" anterior to the pelvic brim. Both were easily removed, and a third suspected. The fourth was surprising, and the fifth disappointing in its absence. All 4 calves were dead on arrival, but fresh and about 35 to 40 lb. in weight. Up until this point, the cow had been very quiet and co-operative. She was released in the loose-box, and, slowly at first but with gathering vigour to a frightening intensity, began the most horrifying train of symptoms I have seen, apart from a unilateral cerebral haemorrhage in a horse. The cow nonchalantly commenced to lick the manger, then the walls, and then with increasing frenzy attacked the calving discharges on her buttocks. Over an area the size of a soup plate, two licks were sufficient to remove the hair, two more for the top layers of skin, and so on until before our startled eyes, the skin appeared to melt away, and blood in fair quantity oozed from the raw surface. The cow by this time was staggering, blundering against the walls, and obviously showing all the signs of blindness and acute cerebral disorganisation but maintaining the maniacal licking of her hind-quarters. I confess my diagnostic mind was working overtime and under great pressure, but I ruled out milk fever and hypomagnesaemia, and then felt there were associations with acute nervous acetonaemia, a condition which some practitioners may not agree exists, but with which I have always had success using intravenous glucose. Accordingly, at top speed, calcium, magnesium, phosphorus and dextrose were produced, and after extreme difficulty in control intravenous injection was made. Within minutes, the fearsome spectacle ended, the cow commenced to eat, and behaved quite normally from then on. However distasteful "blast" therapy might be in principle, it sometimes has most gratifying results in practice.

On later reflection, I believed this to have been a true deficiency pica with nervous involvement, due entirely to the drain of minerals and nourishment from the cow whilst carrying her "brood." The interesting point is the delay of *any* symptoms whatever until delivery had been completed, and the unbelievably accelerated intensity over a period of about 1 minute.

Yours faithfully,
J. R. BENNET.

Northwick House,
Coopers Lane,
Evesham,
Worcs.
December 22nd, 1959.

Warfarin Poisoning in Pigs

Sir,—A farmer decided to reduce the rat population on his farm by means of Warfarin. He mixed 3 tablespoonfuls of this poison with a bucketful of pig meal and distributed it around the premises. Three days later, when no dead rats had appeared, he decided to place some more. He made a similar mixing but was prevented from distributing it immediately, and he therefore placed the bucket in what he thought to be a safe place. Later that day, during the farmer's absence, a newly engaged employee who did not know that Warfarin was being used on the farm was told to feed the pigs, and he fed the bucketful of poisoned meal to 3 store pigs of about 100 lb. weight each.

Although nothing was known as to the toxic dose of Warfarin in the pig—nor of this species' tolerance of the poison—it was considered likely that a fatal dose had been consumed, and for practical purposes this had to be assumed.

The accidental feeding of the poisoned food was discovered 2 hours after administration, and 1 hour later each pig was given 20 mg. vitamin K analogue. This was repeated daily for 5 days. As no symptoms of Warfarin poisoning had appeared this was then discontinued.

On the 5th day after laying the poison, dead rats began to appear. Large quantities of wholesome food were freely available to the rats during this time, and it seems certain that they must have fed largely on this.

On the 8th day after the feeding of poisoned meal to the pigs they were mixed with others and the usual fighting took place. This did not provoke any unusual haemorrhages.

It would seem that in the rat population on the farm, only very small quantities of Warfarin were lethal. It must have been certain that the major portion of the diet consisted of wholesome food.

The "neat" Warfarin as purchased has 0.5 per cent. of active principle. One part of this is to be mixed with 10 parts of meal, then this mixing is to be further mixed with 10 parts of meal, giving a final dilution of the original 0.5 per cent. by 100—*i.e.*—.005 per cent.

Yours faithfully,
F. G. GREER.

79 St. Helens Road,
Leigh.
December 17th, 1959.

The Paris Agricultural Show

Sir,—Some members of the Sussex Veterinary Society would like to repeat last year's enjoyable trip to the Paris Agricultural Show, to be held in 1960 from March 1st to 7th. The week-end of March 5th and 6th would be used.

If anyone interested would care to write to me before the end of January we should be in a position to know how large this party is likely to be and to make the necessary arrangements.

Yours faithfully,
JOHN PASFIELD.

Shelley House,
Bishopric,
Horsham.
December 21st, 1959.

SCIENTIFIC

Protozoan Organisms in Chinchillas

Sir,—The purpose of this communication is to record the finding of protozoan organisms morphologically resembling Giardia in chinchillas in the east of Scotland.

Shelton summarises the previous literature on this parasite. It has been reported as a possible pathogen of chinchillas from several American states; Shelton's work on one ranch showed that 20.95 per cent. of the stock were carriers. Experimental infection caused death in 4 out of 8 chinchillas, and 3 of the survivors excreted the cysts of Giardia for considerable periods.

The present cases were of sudden death in young chinchillas 2 to 3 weeks after weaning. The protozoa were demonstrated in 2 out of 4 animals examined *post mortem*, and in 2 of them Salmonella species were also isolated. In one chinchilla both Giardia and Salmonella were found. The trophozoites were found in the anterior part of the small intestine, and were first seen as actively motile flagellates in fresh wet preparations. They were later demonstrated in dried smears stained by Leishman stain. The trophozoite was somewhat pear-shaped with 2 caudal flagella. Smaller anterior flagella were also noted. The 2 spherical nuclei and the ventral sucker were seen in the stained preparations. Cysts, each containing 4 nuclei, were demonstrated from both the small intestine and the caecum.

There were no lesions in these chinchillas attributable to the protozoa, and it is thought that in these cases their pathogenicity was doubtful.

Yours faithfully,
DAVID B. R. POOLE.

Edinburgh and East of Scotland College of Agriculture,
Veterinary Laboratory,
Cleeve Gardens,
Oakbank Road,
Perth.
December 3rd, 1959.

Reference

SHELTON, G. C. (1954). *Amer. J. Vet. Res.* **XV**. 75.